REMARKS

Claims 7-18 are currently pending in the application.

Amendments

Claims 7 and 13 have been amended to specify that "exothermic" partial oxidation occurs in the plurality of catalytic partial oxidation reactors. Support for this amendment is found throughout the specification and at least at paragraph [0040]. No new matter has been added.

Non-obviousness

The Final Office Action has rejected claims 7-18 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,221,280 to Anumakonda et al. (hereinafter "Anumakonda") in view of U.S. Patent Publication No. 2002/0041986 to Wojtowicz et al. (hereinafter "Wojtowicz"), in further view of U.S. Patent No. 4,490,156 to Marion et al. (hereinafter "Marion"), U.S. Patent No. 4,146,580 to Beavon (hereinafter "Beavon"), or U.S. Patent Application Publication No. 2004/0199038 to Schmidt et al. (hereinafter "Schmidt"), in further view of U.S. Patent No. 6,602,317 to Metius et al. (hereinafter "Metius"), in further view of U.S. Patent Publication No. 2002/0114747 to Marchand et al. (hereinafter "Marchand"), and in further view of U.S. Patent No. 5,776,421 to Matsumura et al. (hereinafter "Matsumura"). The rejection is respectfully traversed.

The Cited References

Anumakonda discloses an apparatus for catalytic partial oxidation ("CPOX") of hydrocarbons.

Wojtowicz discloses a method for producing a hydrogen-rich gas from a hydrocarbonaceous material by (1) pyrolysis of the hydrocarbonaceous material to produce

carbon-rich residue and hydrogen gas and (2) combusting a portion of the carbon-rich residue. Wojtowicz also discloses transferring of heat from *CO-to-CO_2* oxidation to an inlet stream.

Marion discloses a two-stage burner for introducing fuels to a noncatalytic partial oxidation process.

Beavon discloses a process for producing hydrogen sulfide by reacting hydrogen, carbon monoxide, and elemental sulfur.

Schmidt discloses a process for CPOX of hydrogen.

Marchand discloses a steam reforming system comprising a steam reformer which converts a fuel into a reformate stream to be fed into a shift reactor. In one embodiment, heat is transferred from the reactor to a coolant traveling in a direction opposite the direction of reformate flow.

Metius discloses an apparatus for reduction of metal oxides using a furnace. Metius briefly mentions that one or more partial oxidation reactors generate the reducing gas used in furnace.

Matsumura discloses a reforming reactor comprising a reactor chamber including gas flow passages and reforming blocks disposed in each gas flow passage. Matsumura also discloses that the plurality of reforming blocks are distributed in correspondence with a distribution of heat input to the reforming chamber, e.g., from a heating chamber. Matsumura further discloses that the reforming catalyst may be scattered in the reaction gas flow passage or held on one side of the reaction gas flow passage having a set permeable portion. In multiple embodiments described by Matsumura, a reforming block 14 is disposed in all the reaction gas

flow passages and other reforming blocks 13*a* and 13*b* are adjacent to each other. See e.g., FIGS. 1(*b*), 8(*b*), and 9(*b*).

No Prima Facie Obviousness

Applicants submit that a *prima facie* case of obviousness has not been established because a person of ordinary skill in the art would not combine the cited references and even if combined, the combination fails to disclose or suggest all the elements of Applicants' claims.

Nothing in Anumakonda, alone or in combination with Wojtowicz, alternatively, Marion, Beavon, or Schmidt, Marchand, Metius, and Matsumura, provides an apparent reason for a person of ordinary skill in the art to modify Anumakonda in the precise fashion claimed by Applicants. The Supreme Court declared that a combination of elements may be obvious to try only "when there is a **design need or market pressure** to solve a problem **and there are a finite number of identified, predictable solutions** [and] a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp." KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727, 1742, 82 U.S.P.Q.2d 1385 (2007) (emphasis added). No specific design need or market pressure has been given for why a skilled artisan would modify the *CPOX* process disclosed by Anumakonda with (1) the transfer of heat from a *CO-to-CO_2 oxidation* to an inlet stream disclosed in Wojtowicz (2) the fuel temperature disclosed in Marion, Beavon, or Schmidt, (3) the transfer of heat to a coolant traveling in the opposite direction of reformate flow in a *shift reactor* disclosed in Marchand, (4) the one or more *partial oxidation* reactors disclosed in Metius, and (5) the *reforming* block configuration disclosed in Matsumura. A skilled artisan would have no apparent reason to look to the completely different reactions in Wojtowicz,

Marchand, Metius, and Matsumura to modify the CPOX process of Anumakonda to derive the limitations of Applicants' claims.

The Examiner's reasoning that a skilled artisan would choose the particular method of passing a heat exchange fluid through a shell past a plurality of CPOX reactors in the same direction of reactant flow, where the reactors are disposed in the shell parallel to and spaced from one another such that each is offset from another at a plurality of distances to prevent heat spots would only be obtainable by improper hindsight in view of Applicants' claims. "A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning." Id. The number of unrelated uses and techniques for transferring heat from a CPOX reaction is vast. Anumakonda does not disclose any particular method for transferring heat from even one CPOX reactor. Also no reason is given in the cited references as to why a skilled artisan would use the particular methods claimed by Applicants or have any expectation of success in doing so.

Rather the Examiner has posited modifications of the Anumakonda with the disclosures of Wojtowicz, alternatively, Marion, Beavon, or Schmidt, Marchand, Metius, and Matsumura and then given these same *modifications* as the *reasons* why a skilled artisan would modify Anumakonda to derive Applicants' claims. For example, the Examiner argues that it would have been obvious for a skilled artisan to modify Anumakonda "to provide multiple partial oxidation reactors . . . because it [is] well known to have multiple partial oxidation reactors as taught be Metius et al." Office Action, page 6, lines 14-17. This logic is circular and can only be characterized as hindsight.

Furthermore, Matsumura teaches away from *preventing heat spots* in a shell by transferring heat from exothermic partial oxidation in the CPOX reactors to the heat exchange fluid in the shell. "A prior reference must be considered in its entirety, i.e. as a whole, **including portions that would lead away from the claimed invention.**" M.P.E.P. § 2141.02 [VI] (emphasis added). Matsumura discloses endothermic reactions in reforming blocks distributed in a reactor chamber in correspondence with a distribution of *heat input* to the reforming chamber. Matsumura also teaches away from reactors offset from another when it discloses a reforming block 14 which is disposed in all the gas flow passages in a reaction chamber and reforming blocks 13*a* and 13*b* are adjacent to each other. Matsumura further teaches away from disposing reactors such that each is offset from another at a plurality of distances, where each distance is greater than the preceding distance, as required by Applicants' claims, when Matsumura discloses that the reforming catalyst may be held on *one side* of the reaction gas flow passage.

Moreover, the feature of Applicants' claims requiring the CPOX reactors to be disposed such that each is offset from another at a plurality of distances, where each distance is greater than the preceding distance, is not a result effective variable. A particular parameter must first be recognized as a result-effective variable, **i.e., a variable which achieves a recognized result**, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977); MPEP Section 2144.05 (emphasis added). Matsumura does not disclose that offset distances of reforming blocks as preventing heat spots. Rather, Matsumura teaches that the reforming blocks may be distributed in a reactor chamber in correspondence with a distribution of heat input. Matsumura then teaches uniform temperature distribution in the reforming reactor

may be achieved with *a reforming block disposed in all reaction gas flow passages* and reforming blocks *adjacent* to each other allow for. These disclosures are in direct contrast to Applicant's claims, which require each CPOX reactor *offset from another at a plurality of distances*. Thus, Matsumura does not teach or recognize that the distance between reactors achieves a recognized result.

Therefore, Applicants claims are novel and nonobvious and the rejections should be withdrawn.

CONCLUSION

Applicants believe that the present application is in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The foregoing is submitted as a full and complete response to the Office Action mailed June 10, 2008.

It is not believed that extensions of time or fees for addition of claims are required. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 C.F.R. § 1.136(a), and any fee required therefore (including fees for net addition of claims), or credit of any overpayment, is hereby authorized to be charged to Deposit Account No. 19-5029 (Reference No. 19441-0072). In addition, if there are any issues that can be resolved by a telephone conference or an Examiner's amendment, the Examiner is invited and encouraged to call the undersigned attorney at (404) 853-8036.

Respectfully submitted,

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Date: 10/10/08

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